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Iwase et al.

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(54) **INFORMATION PROCESSING METHOD AND TERMINAL APPARATUS**

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(52) **U.S. Cl.**
CPC ***G06F 9/542*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 9/542; G06F 1/14; G06F 13/00; H04N 21/436; H04N 21/4884;
(Continued)

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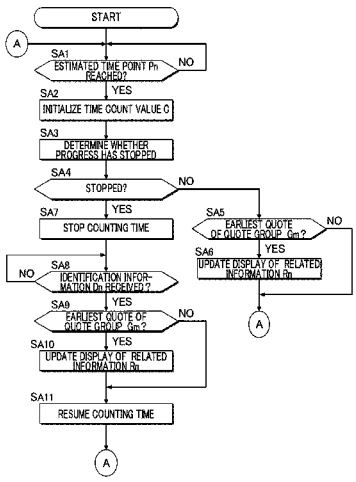
(57) **ABSTRACT**

A terminal apparatus receives identification information for events transmitted sequentially in conjunction with occurrence of events; sequentially identifies estimated time points at which each event is estimated to occur; determines whether progress of the plurality of events has stopped depending on whether it receives identification information for each event at a corresponding estimated time point for each event; in each of a plurality of event groups obtained by temporally dividing events, when an estimated time point is reached for an earliest event among at least one event belonging to each event group, causes a playback device to play related information for the at least one event belonging to each event group, and when progress of events is determined to have stopped, defers update of related information, which the playback device caused to play, and then resumes update of played related information when identification information is received after the determination.

6 Claims, 9 Drawing Sheets



(58) **Field of Classification Search**
CPC H04N 21/41415; H04N 21/42203; G11B 27/10; G11B 27/105; H04M 11/06
See application file for complete search history.

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FIG. 1

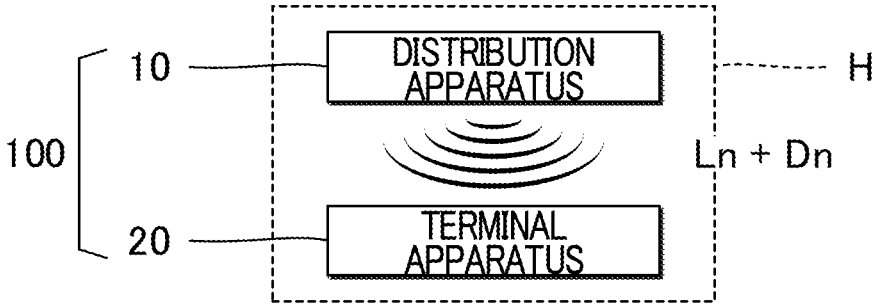


FIG. 2

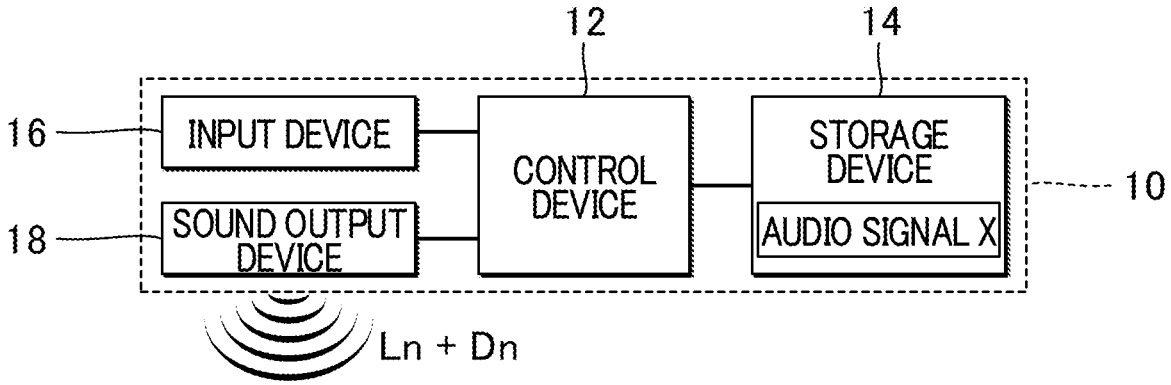


FIG. 3

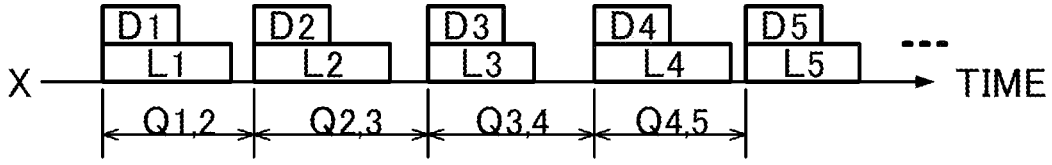


FIG. 4

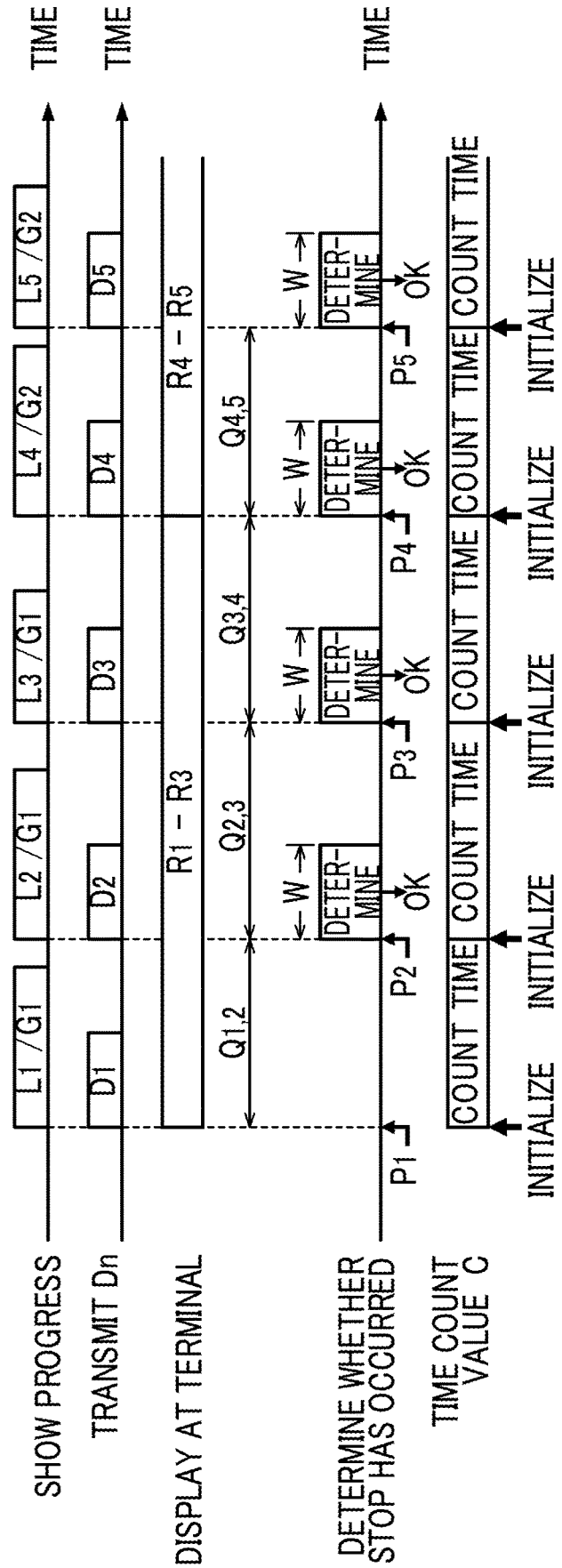

SHOW PROGRESS
TRANSMIT Dn
DISPLAY AT TERMINAL
DETERMINE WHETHER STOP HAS OCCURRED
TIME COUNT VALUE C
TIME
L1 /G1
L2 /G1
L3 /G1
L4 /G2
L5 /G2
D1
D2
D3
D4
D5
R1 – R3
R4 – R5
Q1,2
Q2,3
Q3,4
Q4,5
W
DETER-MINE
OK
P1
P2
P3
P4
P5
COUNT TIME
INITIALIZE

FIG. 5

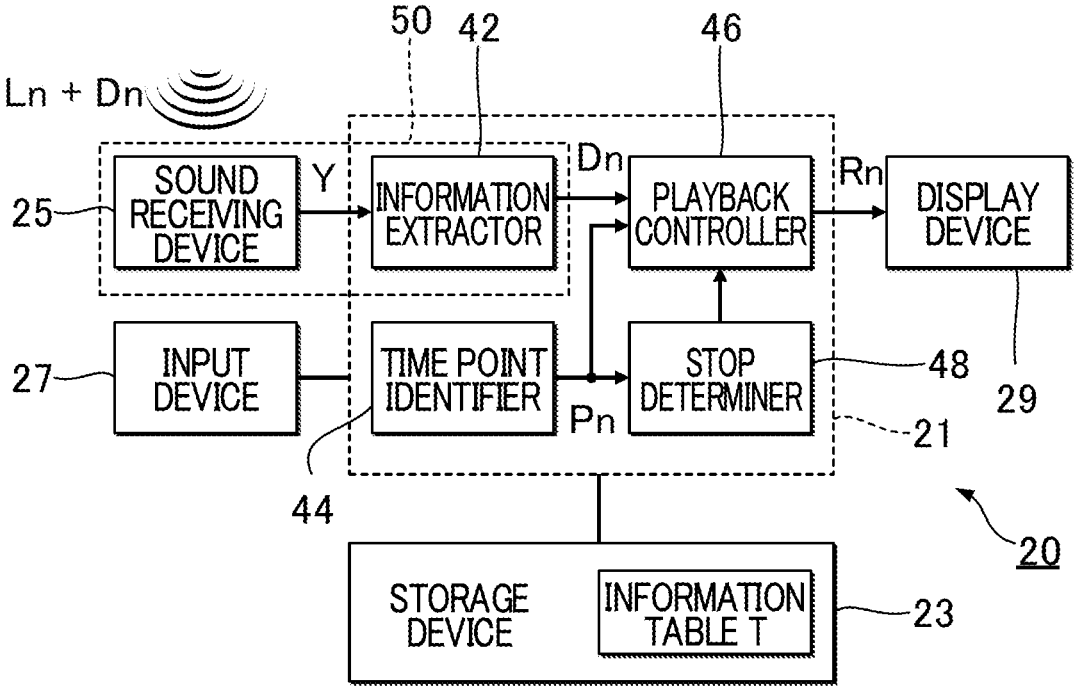

50
42
46
Ln + Dn
25
SOUND RECEIVING DEVICE
Y
INFORMATION EXTRACTOR
Dn
PLAYBACK CONTROLLER
Rn
DISPLAY DEVICE
27
INPUT DEVICE
TIME POINT IDENTIFIER
Pn
STOP DETERMINER
48
29
21
44
20
STORAGE DEVICE
INFORMATION TABLE T
23

FIG. 6

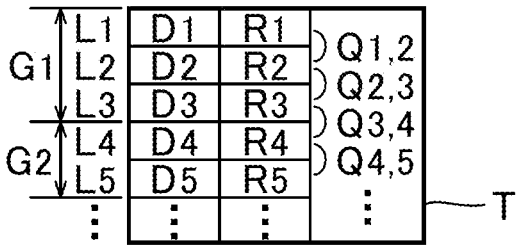

G1
G2
L1
L2
L3
L4
L5
D1
D2
D3
D4
D5
R1
R2
R3
R4
R5
Q1,2
Q2,3
Q3,4
Q4,5
T

FIG. 7

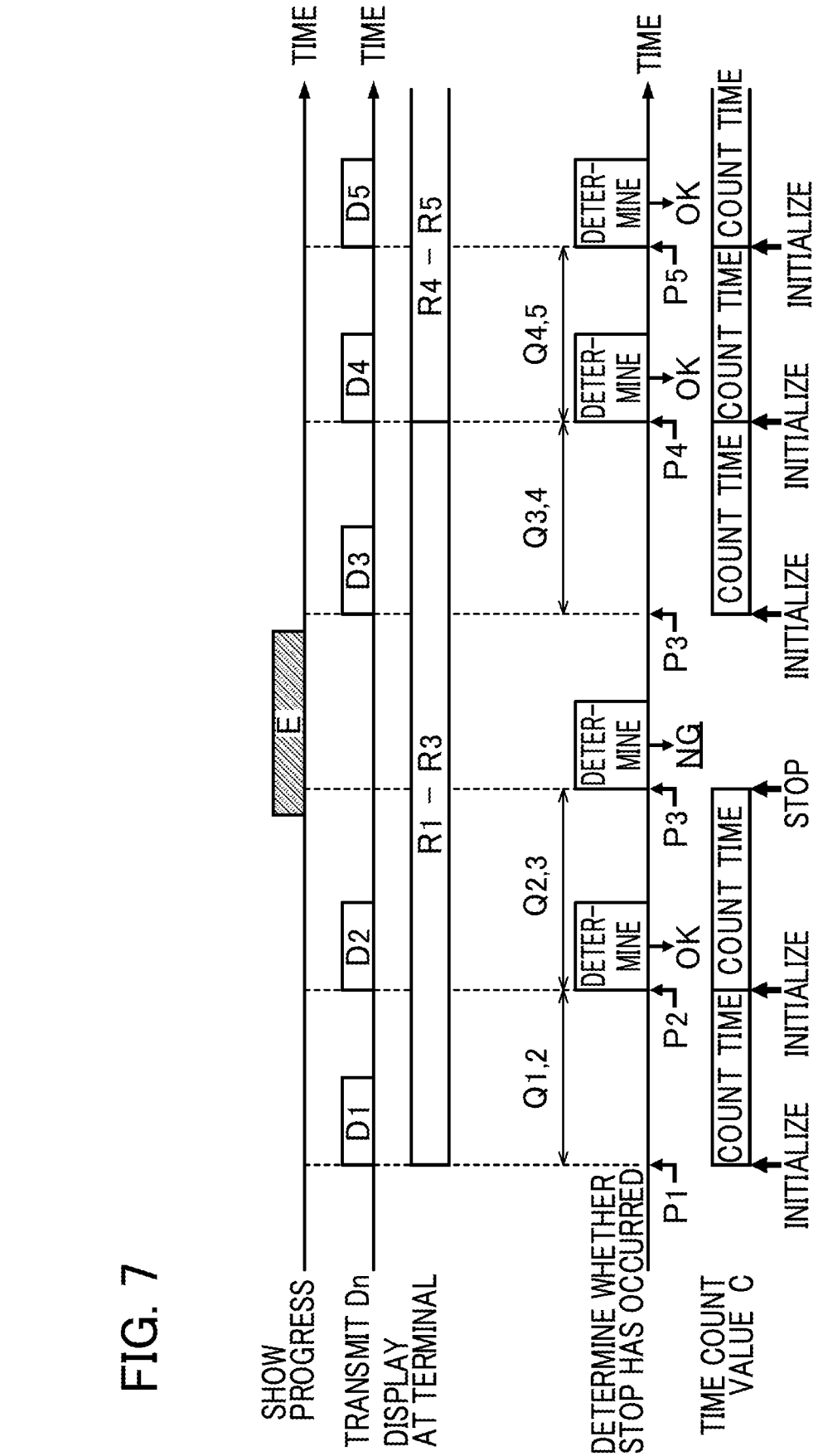

SHOW PROGRESS
TRANSMIT Dn
DISPLAY AT TERMINAL
DETERMINE WHETHER STOP HAS OCCURRED
TIME COUNT VALUE C
TIME
E
D1
D2
D3
D4
D5
R1 – R3
R4 – R5
Q1,2
Q2,3
Q3,4
Q4,5
DETER-MINE
OK
NG
P1
P2
P3
P4
P5
COUNT TIME
INITIALIZE
STOP

FIG. 8

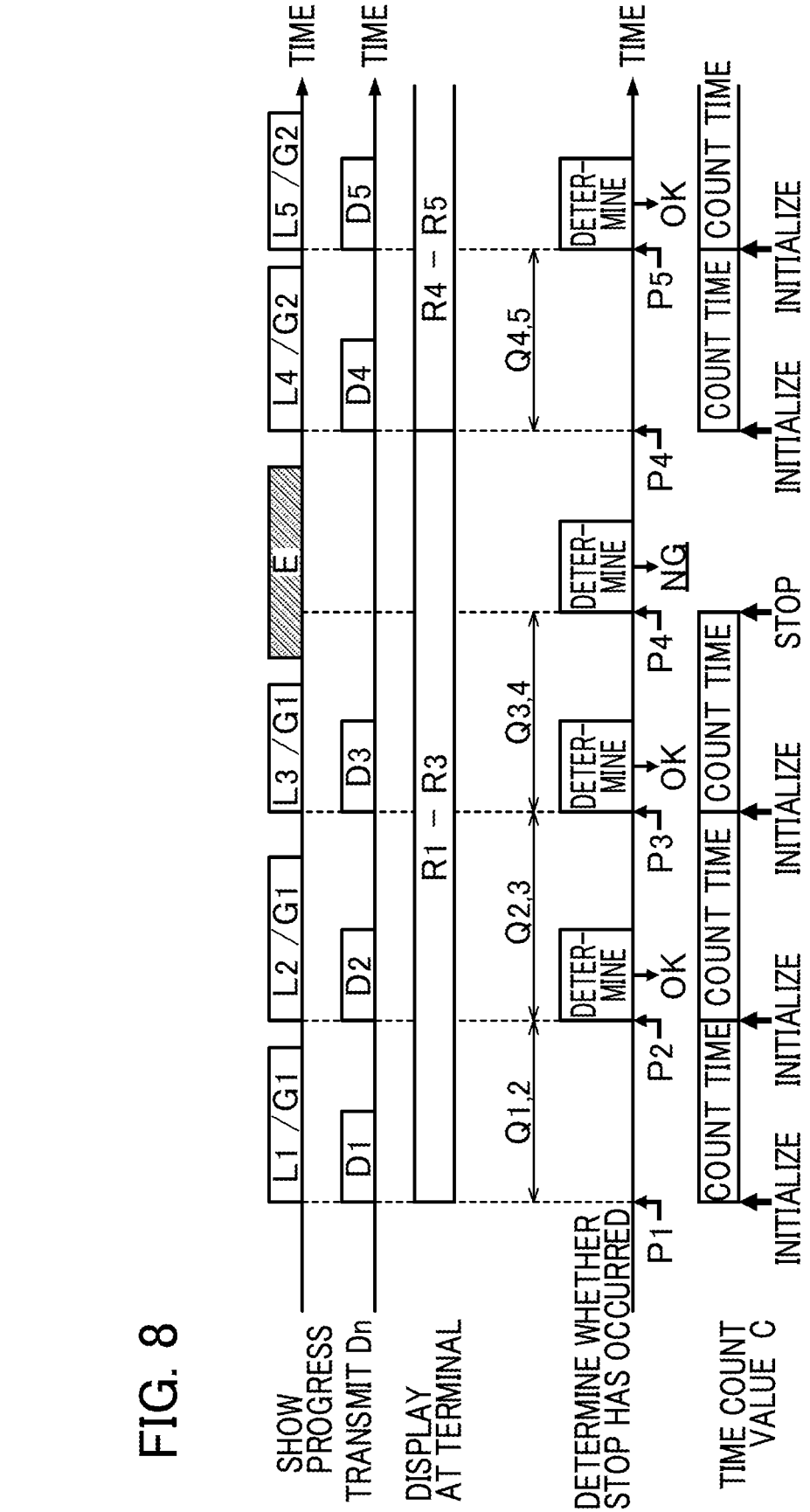

SHOW PROGRESS
TRANSMIT Dn
DISPLAY AT TERMINAL
DETERMINE WHETHER STOP HAS OCCURRED
TIME COUNT VALUE C
TIME
L1 /G1
L2 /G1
L3 /G1
E
L4 /G2
L5 /G2
D1
D2
D3
D4
D5
R1 – R3
R4 – R5
Q1,2
Q2,3
Q3,4
Q4,5
DETER-MINE
OK
NG
P1
P2
P3
P4
P5
COUNT TIME
INITIALIZE
STOP

FIG. 9

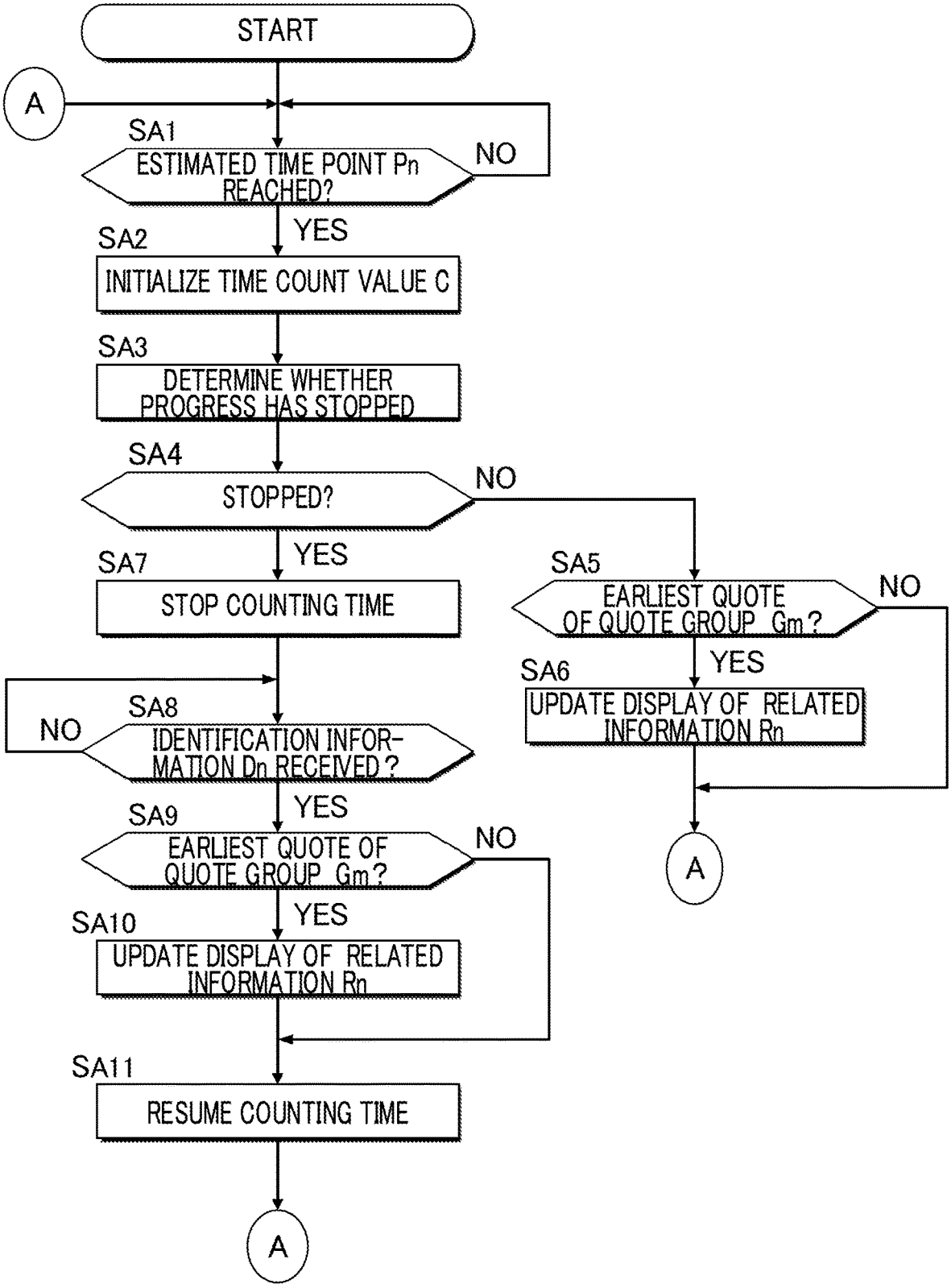

START
A
SA1
ESTIMATED TIME POINT Pn REACHED?
NO
YES
SA2
INITIALIZE TIME COUNT VALUE C
SA3
DETERMINE WHETHER PROGRESS HAS STOPPED
SA4
STOPPED?
NO
YES
SA7
STOP COUNTING TIME
SA5
EARLIEST QUOTE OF QUOTE GROUP Gm?
NO
YES
SA6
UPDATE DISPLAY OF RELATED INFORMATION Rn
A
NO
SA8
IDENTIFICATION INFOR-MATION Dn RECEIVED?
YES
SA9
EARLIEST QUOTE OF QUOTE GROUP Gm?
NO
YES
SA10
UPDATE DISPLAY OF RELATED INFORMATION Rn
SA11
RESUME COUNTING TIME
A

FIG. 10

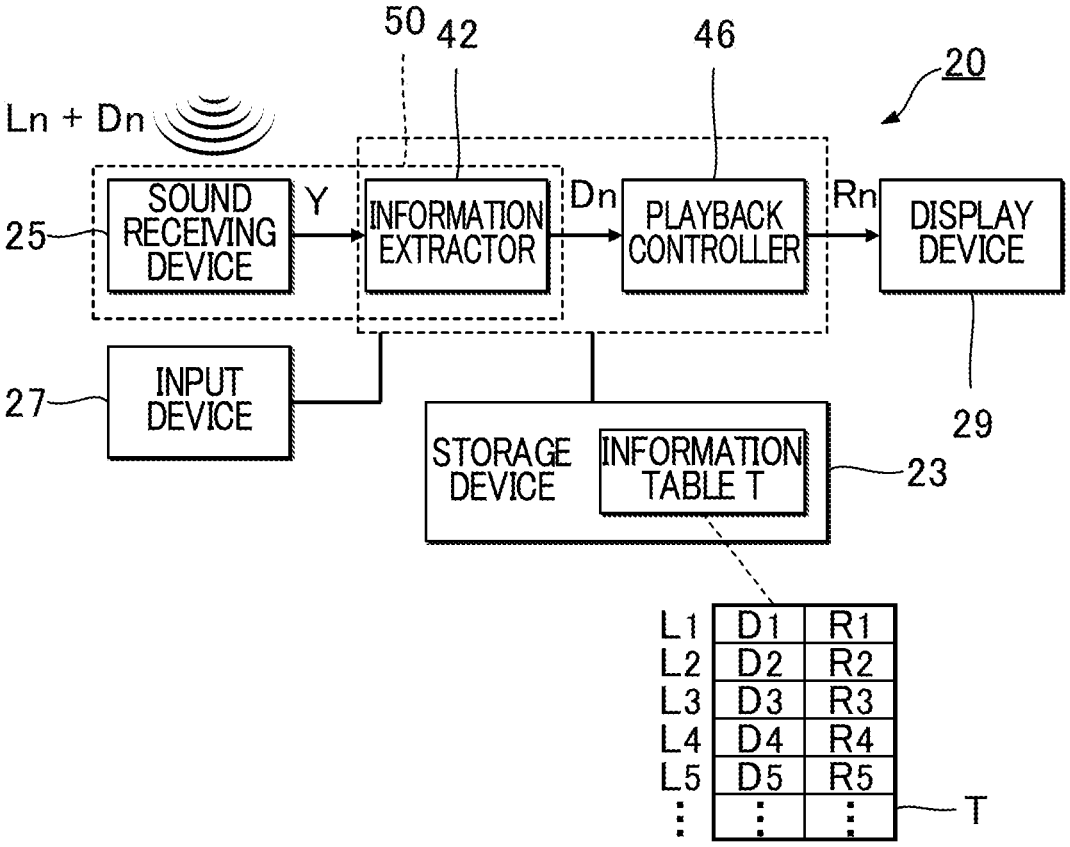

50
42
46
20
Ln + Dn
25
SOUND RECEIVING DEVICE
Y
INFORMATION EXTRACTOR
Dn
PLAYBACK CONTROLLER
Rn
DISPLAY DEVICE
27
INPUT DEVICE
29
STORAGE DEVICE
INFORMATION TABLE T
23
L1 D1 R1
L2 D2 R2
L3 D3 R3
L4 D4 R4
L5 D5 R5
T

FIG. 11

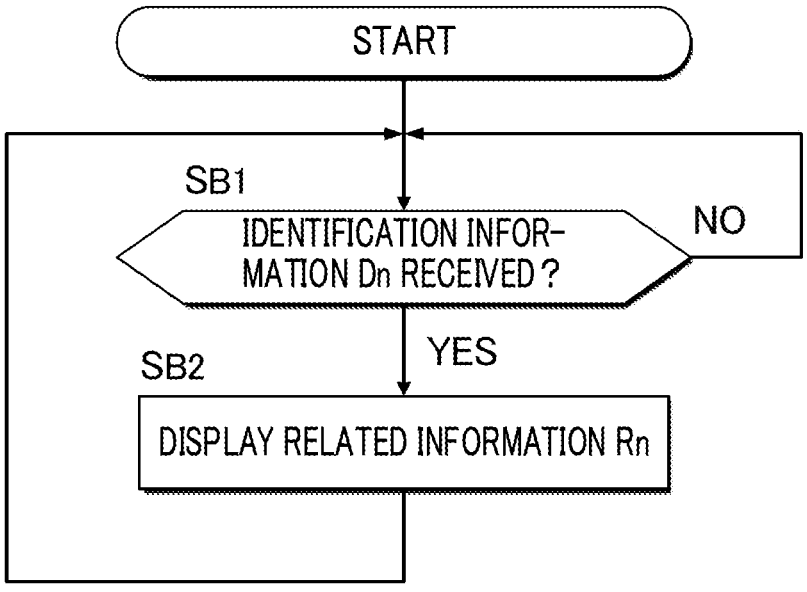

START
SB1
IDENTIFICATION INFOR-MATION Dn RECEIVED?
NO
YES
SB2
DISPLAY RELATED INFORMATION Rn

FIG. 12

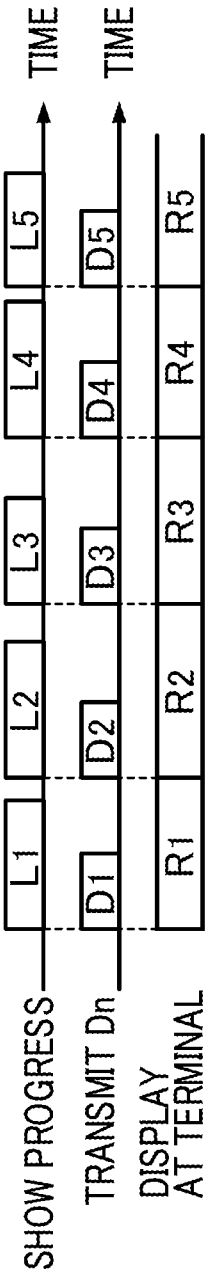
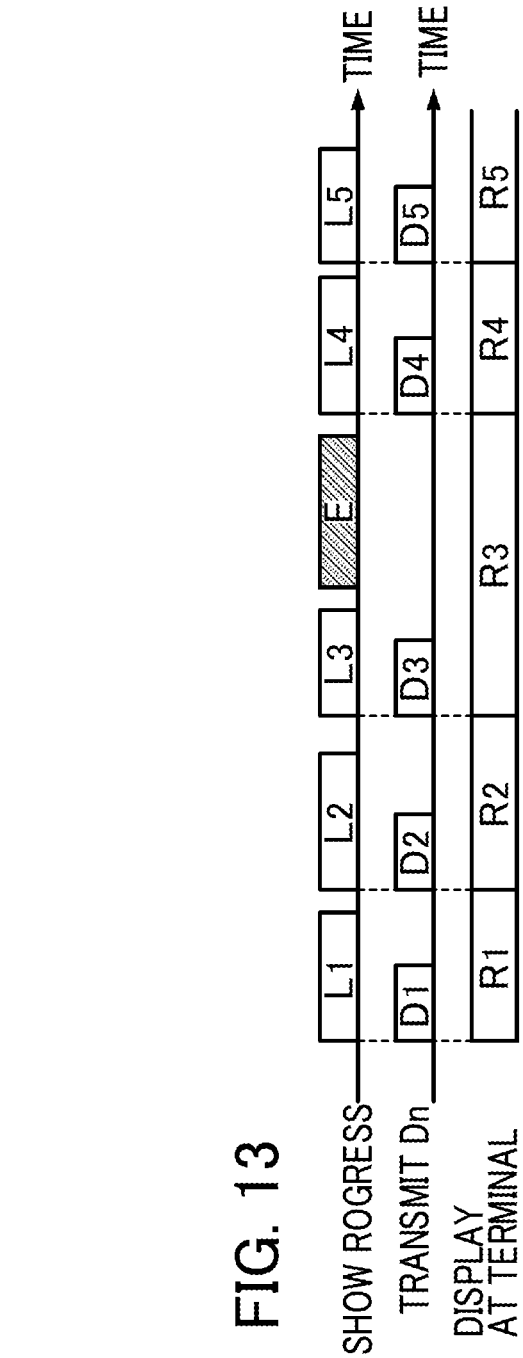

TIME
TIME
L1
L2
L3
L4
L5
D1
D2
D3
D4
D5
R1
R2
R3
R4
R5
SHOW PROGRESS
TRANSMIT Dn
DISPLAY AT TERMINAL

FIG. 13


SHOW ROGRESS
TRANSMIT Dn
DISPLAY AT TERMINAL
TIME
TIME
L1
L2
L3
E
L4
L5
D1
D2
D3
D4
D5
R1
R2
R3
R4
R5

INFORMATION PROCESSING METHOD AND TERMINAL APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a Continuation Application of PCT Application No. PCT/JP2017/015429, filed Apr. 17, 2017, and is based on and claims priority from Japanese Patent Application No. 2016-086936, filed Apr. 25, 2016, the entire contents of each of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a technique for providing information to terminal apparatuses.

Description of Related Art

There exist in the art proposed conventional techniques for providing to a user information that relates to a variety of shows such as theatre plays or concerts, with the information being provided to a terminal apparatus of the user in conjunction with a progress of a show. For example, Japanese Patent Application Laid-Open Publication No. 2009-213180 (hereafter, Patent Document 1) discloses a configuration for sequentially transmitting, to a portable device of a user, time codes in conjunction with the progress of a show, and also causing commentary information, such as subtitles, to be displayed on the portable device at a time point derived from each time code.

The technique disclosed in Patent Document 1, however, has a drawback in that a portable device may fail to update information displayed thereon in a case where a time code is not properly received at the device.

SUMMARY OF THE INVENTION

Taking into consideration the above circumstances, an object of the present invention is to play, at appropriate timings, information related to events that occur chronologically.

In order to solve the above object, an information processing method according to one aspect of the present invention includes: receiving identification information for a plurality of events transmitted sequentially in conjunction with occurrence of the plurality of events; sequentially identifying estimated time points at each of which each event is estimated to occur; determining whether progress of the plurality of events has stopped depending on whether identification information for each event is received at around a corresponding estimated time point for each event; and, in each of a plurality of event groups obtained by temporally dividing the plurality of events, when an estimated time point is reached for an earliest event among at least one event belonging to each event group, causing a playback device to play related information for the at least one event belonging to each event group, and when the progress of the plurality of events is determined to have stopped, deferring update of the related information, which the playback device is being caused to play, and then resuming update of the played related information when the identification information is received after the determination.

A terminal apparatus according to another aspect of the present invention has at least one processor configured to execute stored instructions to: receive identification information for a plurality of events transmitted sequentially in conjunction with occurrence of the plurality of events; sequentially identify estimated time points at each of which each event is estimated to occur; determine whether progress of the plurality of events has stopped depending on whether identification information for each event is received at around a corresponding estimated time point for each event; and, for each of a plurality of event groups obtained by temporally dividing the plurality of events, when an estimated time point is reached for an earliest event among at least one event belonging to each event group, cause a playback device to play related information for the at least one event belonging to each event group, and when the progress of the plurality of events is determined to have stopped, defer update in the related information, which the playback device is being caused to play, and then resume the update in the played related information when the identification information is received after the determination.

A terminal apparatus according to still another aspect of the present invention has at least one processor configured to execute stored instructions to: receive identification information for a plurality of events transmitted sequentially in conjunction with occurrence of the plurality of events; and cause a playback device to play related information for each event that corresponds to the received identification information of each event.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of an information providing system according to a first embodiment of the present invention.

FIG. **2** is a block diagram of a distribution apparatus.

FIG. **3** is an explanatory diagram illustrating an audio signal.

FIG. **4** is an explanatory diagram illustrating a relation between the progress of a show and an operation of a terminal apparatus.

FIG. **5** is a block diagram of a terminal apparatus.

FIG. **6** is a schematic diagram of an information table.

FIG. **7** is an explanatory diagram illustrating an operation of the terminal apparatus when an unexpected situation arises.

FIG. **8** is an explanatory diagram illustrating an operation of the terminal apparatus when an unexpected situation arises.

FIG. **9** is a flowchart illustrating an operation of the terminal apparatus.

FIG. **10** is a block diagram of a terminal apparatus according to a second embodiment.

FIG. **11** is a flowchart illustrating an operation of the terminal apparatus according to the second embodiment.

FIG. **12** is an explanatory diagram illustrating an operation of the terminal apparatus according to the second embodiment.

FIG. **13** is an explanatory diagram illustrating an operation of the terminal apparatus when an unexpected situation arises.

DESCRIPTION OF THE EMBODIMENTS

First Embodiment

FIG. **1** is a block diagram showing an information providing system **100** according to a first embodiment of the

present invention. The information providing system **100** of the first embodiment is a computer system for providing users with information related to various shows, such as theatre plays, concerts, movies, or the like, in conjunction with a progress of the show, and includes a distribution apparatus **10** and a terminal apparatus **20** as shown in FIG. **1**. The distribution apparatus **10** is installed at a facility H, such as a theatre or hall, where various shows are performed. A user who visits the facility H carries the terminal apparatus **20**. The terminal apparatus **20** is a portable information processing terminal, such as a portable telephone, a smartphone, etc. In reality, multiple terminal apparatuses **20** are present in the facility H, but for convenience of explanation the following description focuses on a single terminal apparatus **20**.

In the first embodiment, a case is assumed where a show (e.g., character show) is performed in the facility H. In the show, multiple quotes prepared in advance are voiced chronologically in a predetermined order. A user views the show while carrying the terminal apparatus **20**. The terminal apparatus **20** displays information that relates to each of multiple quotes voiced chronologically (hereafter, "related information"). The terminal apparatus **20** sequentially displays the related information in conjunction with the progress of the show. More specifically, for example, text representative of each quote (i.e., subtitles) are displayed at the terminal apparatus **20**. With the above configuration, a user of the terminal apparatus **20** is able to visually understand the quotes of the show by checking, whenever necessary, related information sequentially displayed on the terminal apparatus **20** while viewing the show. Thus, the above configuration has an advantage, for example, in that a hearing-impaired person is able to understand the content of the show.

FIG. **2** is a block diagram of the distribution apparatus **10**. As shown in FIG. **2**, the distribution apparatus **10** of the first embodiment includes a control device **12**, a storage device **14**, an input device **16**, and a sound output device **18**. The control device **12** is, for example, processing circuitry, such as a CPU (Central Processing Unit) and integrally controls each element of the distribution apparatus **10**. The storage device **14** consists of well-known storage media, such as a semiconductor storage medium and a magnetic storage medium, or a combination of various types of storage media. The storage device **14** has stored therein programs executed by the control device **12** and various data used by the control device **12**. The storage device **14** of the first embodiment has stored therein an audio signal X. The audio signal X is a time signal representative of voices of multiple quotes spoken in the show.

The sound output device **18** is a speaker device installed at the facility H, for example, and plays sound represented by the audio signal X. For the sake of convenience, a D/A converter, which converts the audio signal X from digital to analog, and an amplifier, which amplifies the audio signal X, have been omitted from the drawings. The input device **16** is operation equipment for receiving instructions from an administrator who runs the show. For example, by operating the input device **16** as appropriate, the administrator is able to instruct the distribution apparatus **10** to reproduce or stop reproducing the audio signal X whenever necessary. The control device **12** supplies the audio signal X to the sound output device **18** according to instructions provided by the administrator via the input device **16**. Consequently, voices of each of the multiple quotes are sequentially played from the sound output device **18**. The audio signal X is reproduced in conjunction with performances of performers on a stage of the facility H. Thus, this is how the show is configured.

FIG. **3** is an explanatory diagram illustrating audio components contained in the audio signal X. As shown in FIG. **3**, audio components of multiple quotes L_n (L_1, L_2, L_3, . . .) are contained in different sections of the audio signal X (hereafter, "playback section") (n is a natural number). Accordingly, as a result of the sound output device **18** reproducing the audio signal X, the audio components of quotes L_n are sequentially output as sounds. Additionally, there is contained in a playback section of one quote L_n of the audio signal X an audio component representative of identification information D_n of the quote L_n. The identification information D_n (D_1, D_2, D_3, . . .) is a sign that identifies a quote L_n. The audio component of the identification information D_n is a modulated component generated by a modulation process, such as frequency modulation that modulates a carrier wave, such as a sine wave of a predetermined frequency, with the identification information D_n or spread modulation of the identification information D_n with use of a spreading code. The frequency band of the audio component of the identification information D_n is set to fall within a range (e.g., 18 kHz or higher and 20 kHz or lower) that is higher than a frequency band of sound audible to a user in a normal environment.

The audio signal X, shown as an example above, is supplied to the sound output device **18** in FIG. **2**. Consequently, the audio component of the quote L_n and that of the identification information D_n are output from the sound output device **18**. Thus, the sound output device **18** of the first embodiment functions as audio equipment that outputs the audio component of the quote L_n as sound and also functions as a transmitter that transmits the identification information D_n of the quote L_n to the surrounding area by means of sound communication that utilizes sound waves (i.e., vibration of air) as a transmission medium.

FIG. **4** is an explanatory diagram illustrating a relation between the progress of a show and an operation of the terminal apparatus **20**. As shown in FIG. **4**, the distribution apparatus **10** sequentially transmits identification information D_n of multiple quotes L_n via sound communication, in conjunction with the playback of the quotes L_n (i.e., the progress of the show). For example, in conjunction with the playback of an n-th quote L_n, the identification information D_n of this quote L_n is transmitted from the distribution apparatus **10**. In other words, identification information D_n are sequentially transmitted in synchronization with the sequential playback of quotes L_n. FIG. **3** and FIG. **4** show a case of starting to transmit identification information D_n of a quote L_n at the same time as initiation of a playback section for the quote L_n. The temporal relation between the playback section of a quote L_n and a period during which corresponding identification information D_n is transmitted may be changed as appropriate. If a configuration is adopted whereby identification information D_n is transmitted multiple times (repeatedly transmitted) during the playback section of a corresponding quote L_n, a possibility of the terminal apparatus **20** failing to receive the identification information D_n is reduced.

FIG. **5** is a block diagram of the terminal apparatus **20**. As shown in FIG. **5**, the terminal apparatus **20** has a control device **21**, a storage device **23**, a sound receiving device **25**, an input device **27**, and a display device **29**. The control device **21** is processing circuitry, such as a CPU, and integrally controls each element of the terminal apparatus **20**. The storage device **23** is formed of a well-known storage

media, such as a magnetic recording medium or a semiconductor recording medium, or a combination of various types of storage media, and has stored therein programs executed by the control device **21** and various data used by the control device **21**. The storage device **23** of the first embodiment has stored therein an information table T illustrated in FIG. **6**. For example, an information table T received from a management server (not shown) is stored in the storage device **23**, where the information table T is received by the terminal apparatus **20** via a communication network, such as a mobile communication network or the Internet.

As shown in FIG. **6**, the information table T is a data table in which, for each of multiple quotes L_n that may be voiced in a show, a pair of identification information D_n (D_1, D_2, D_3, . . .) and related information R_n (R_1, R_2, R_3, . . .) is registered. Pairs of the identification information D_n and the related information R_n are listed in the spoken order of corresponding quotes L_n in the show. Related information R_n for each quote L_n in the first embodiment is text data representative of a text of each quote L_n. As described above, the identification information D_n is a sign that identifies each quote L_n but may also be thought of as a sign that identifies related information R_n.

As shown in FIG. **6**, there are registered in the information table T of the first embodiment time differences $q_{n,n+1}$ ($Q_{1,2}$, $Q_{2,3}$, $Q_{3,4}$, . . .). Each time difference $Q_{n,n+1}$ is registered for a corresponding pair of two consecutive quotes (L_n and L_{n+1}). The time difference Q is a time between two consecutive quotes L_n within the audio signal X. Specifically, as shown in FIG. **3**, a time difference $Q_{n,n+}$, is an interval between the start point of the playback section of the n-th quote L_n and the start point of the playback section of the immediately subsequent quote L_{n+1}. Therefore, if the show progresses as scheduled, within the sound played by the sound output device **18** of the distribution apparatus **10**, the voice of a quote L_{n+1} will start at a time point when a time difference $Q_{n,n+1}$ has elapsed from the time point at which the voice of a quote L_n starts. For example, the voice of the second quote L_2 will start at a time point at which a time difference $Q_{1,2}$ has elapsed from the start of the voice of the first quote L_1, and the voice of the third quote L_3 will start at a time point at which a time difference $Q_{2,3}$ has elapsed from the start of the voice of the quote L_2.

As shown in FIG. **6**, multiple quotes L_n are divided into multiple sets on a time axis (hereafter, "quote group") G_m (m is a natural number). Each quote group G_m (G_1, G_2, . . .) is a set of consecutive multiple quotes L_n on a time axis. FIG. **6** shows a case in which the first to third quotes L_n (L_1, L_2, and L_3), which makes three quotes, are grouped to form a first quote group G_1, and the fourth and fifth quotes L_n (L_4 and L_5), which makes two quotes, are grouped to form a second quote group G_2. The information table T defines sections between quote groups G_m (boundaries between consecutive quote groups G_m). For example, data indicative of a boundary between consecutive quote groups (G_m or G_{m+1}), or data (e.g., flag) indicative of an earliest or a last quote L_n of each quote group G_m is included in the information table T. The total number of quotes L_n belonging to each quote group G_m varies for each quote group G_m. A quote group G_m may be comprised of a single quote L_n. If the identification information D_n the related information R_n, the time difference $Q_{n,n+1}$, and the quote group G_m can be made to correspond with one another, the information table T may be configured to have multiple tables.

The sound receiving device **25** (microphone) in FIG. **5** is audio equipment that receives sound and generates an audio signal Y. Specifically, the sound receiving device **25** generates an audio signal Y representative of a sound played by the sound output device **18** of the distribution apparatus **10** (i.e., mixed sound of an audio component of a quote L_n and that of corresponding identification information D_n). For the sake of convenience, an A/D converter, which converts the audio signal Y generated by the sound receiving device **25** from analog to digital format, has been omitted from the drawings.

The input device **27** is input equipment operable by a user for providing various instructions to the terminal apparatus **20**. For example, a set of multiple operators operable by a user or a touch panel for detecting touch operations made by a user is suitable for use as the input device **27**. The display device **29** (e.g., liquid display panel) displays related information R_n thereon under control of the control device **21**. Either one or both of the sound receiving device **25** and the display device **29** may be configured as a unit separate from the terminal apparatus **20**, while being connected to the terminal apparatus **20**.

As shown in FIG. **5**, the control device **21** executes a program stored in the storage device **23**, whereby there are realized a plurality of functions (an information extractor **42**, a time point identifier **44**, a playback controller **46**, and a stop determiner **48**) for providing related information R to users. A configuration in which the functions of the control device **21** illustrated above are dividedly allocated to a plurality of devices. Also applicable is a configuration in which part or all of the functions of the control device **21** is realized by dedicated electronic circuitry.

The information extractor **42** extracts identification information D_n of each quote L_n from the audio signal Y generated by the sound receiving device **25**. Specifically, the information extractor **42** selects audio components of a frequency range containing the identification information D_n from the audio signal Y by means of a band path filter, for example, and executes on the audio components a demodulation process corresponding to a modulation process used in generating the audio signal X, thereby to extract the identification information D_n. Specifically, each time the sound output device **18** outputs the sound of a quote L_n, the identification information D_n of the quote L_n is extracted, whereby the identification information D_n is extracted sequentially. As will be understood from the foregoing description, the sound receiving device **25** of the first embodiment is used not only for voice communication between terminal apparatuses **20** or for recording sounds when capturing moving images, but also for receiving identification information D_n via sound communication. In other words, the sound receiving device **25** and the information extractor **42** function as an information receiver **50** that can receive, in conjunction with the playback of multiple quotes L_n, identification information D_n of quotes L_n sequentially transmitted from the distribution apparatus **10**.

As shown in FIG. **4**, the time point identifier **44** sequentially identifies time points at each of which a quote L_n is estimated to be voiced (hereafter, "estimated time point") P_n. Specifically, the time point identifier **44** identifies a time point when a time difference $Q_{n,n+1}$ specified in the information table T has elapsed from a certain estimated time point P_n as an estimated time point P_{n+1} at which the (n+1)st quote L_{n+1} is to be voiced. Further, as shown in FIG. **4**, an estimated time point P_3 of the third quote L_3 is a time point at which a time difference $Q_{2,3}$ has elapsed from an estimated time point P_2 of an immediately previous quote L_2. The time point identifier **44** of the first embodiment causes a time count value C (e.g., a count value by an internal timer) to increase over time from an estimated time point P_n, and

identifies as an estimated time point P_{n+1} of a quote L_{n+1} a time point at which the time count value C reaches a time difference $Q_{n,n+1}$ specified by the information table T. For the first quote L_1, the time point identifier **44** identifies as an estimated time point P_1 a time point at which the information receiver **50** receives the first identification information D_1 from the distribution apparatus **10**. As shown in FIG. **4**, each time each estimated time point P_n is reached, the time count value C is initialized to zero.

The playback controller **46** of FIG. **5** controls display of related information R_n performed by the display device **29**. Specifically, the playback controller **46**, for each of multiple quote groups G_m, causes the display device **29** to display related information R_n of multiple quotes L_n belonging to each quote group G_m. The display is triggered by arrival of an estimated time point P_n corresponding to the earliest quote L_n of the quote group G_m. For example, as shown in FIG. **4**, when an estimated time point P_1 of the earliest quote L_1 within a quote group G_1 is reached, the playback controller **46** causes the display device **29** to display related information R_n of multiple quotes L_n (related information R_1, R_2, and R_3) belonging to the quote group G_1. When an estimated time point P_4 of the earliest quote L_4 within a quote group G_2 is reached, the playback controller **46** causes the display device **29** to display related information R_n of multiple quotes L_n (related information R_4 and R_5) belonging to the quote group G_2. Thus, for each estimated time point P_n the time point identifier **44** identifies for the earliest quote L_n of a quote group G_m, related information R_n displayed on the display device **29** is updated. As will be understood from the foregoing description, a quote group G_m is a set of multiple quotes L_n displayed collectively on the terminal apparatus **20**.

In actuality, however, an unexpected event that is not presumed (hereafter, "unexpected situation") could occur between consecutive quotes L_n in a show. An unexpected situation is a circumstance that lasts for a variable period, a typical example of which is improvised acting by a performer (ad-lib). In a case where an unexpected situation arises, the administrator operates the input device **16** of the distribution apparatus **10** to instruct the control device **12** to stop reproduction of an audio signal X, and to resume the reproduction of the audio signal X when the unexpected situation ends. The control device **12** of the distribution apparatus **10** stops or resumes the reproduction of the audio signal X depending on an instruction from the administrator. As will be understood from the foregoing description, when an unexpected situation arises, the progress of the playback of the quote L_n (hereafter, "quote progress") stops. Accordingly, it is essential to detect an occurrence of an unexpected situation (stop in quote progress) and to identify an estimated time point P_n of each of subsequent quotes L_n, in order to realize timely display of related information R_n with progression of the quote.

Taking into consideration the circumstances discussed above, the stop determiner **48** of FIG. **5** determines whether the quote progress has stopped (i.e., whether an unexpected situation has arisen). As described above with reference to FIG. **3**, the distribution apparatus **10** transmits identification information D_n of each quote L_n together with the playback of the quote L_n. Therefore, it is expected that in a situation where the show is progressing as scheduled (i.e., an unexpected situation has not arisen), the information receiver **50** should receive identification information D_n of a quote L_n at around an estimated time point P_n of the quote L_n. On the other hand, in a case where the quote progress has stopped, the information receiver **50** will not be able to receive identification information D_n of a quote L_n at around an estimated time point P_n of the quote L_n.

Taking into account the foregoing, the stop determiner **48** of the first embodiment determines whether the quote progress has stopped depending on whether the information receiver **50** has received identification information D_n of a quote L_n at around an estimated time point P_n that the time point identifier **44** identifies for each quote L_n. Specifically, the stop determiner **48**, as shown in FIG. **4**, determines that the quote progress has not stopped if the information receiver **50** receives identification information D_n of each quote L_n during a predetermined period W (hereafter, "determination period") including an estimated time point P_n of each quote L_n, and determines that the quote progress has stopped if the information receiver **50** does not receive the identification information D_n within the determination period W.

In a case where the stop determiner **48** determines that the quote progress has not stopped, an operation of the time point identifier **44** sequentially identifying estimated time points P_n and an operation of the playback controller **46** sequentially updating the display of related information R_n continue, as described above. On the other hand, in a case where the stop determiner **48** determines that the quote progress has stopped, identification of an estimated time point P_n (increase in the time count value C) by the time point identifier **44** and update in display of related information R_n by the playback controller **46** are deferred. Specific operational examples of the case of quote progress stoppage are described in the following.

FIG. **7** is an explanatory diagram illustrating an operation of a case where, as a result of an unexpected situation E arising between two consecutive quotes L (L_n and L_{n+1}) within a single quote group G_m, the quote progress stops immediately before the quote L_{n+1}. Specifically, FIG. **7** shows a case where an unexpected situation E arises between a quote L_2 and a quote L_3 within a quote group G_1, and as a result the quote L_3 is delayed.

The stop determiner **48** determines whether the information receiver **50** receives the identification information D_3 of the quote L_3 within a determination period W starting from an estimated time point P_3 the time point identifier **44** has identified. As shown in FIG. **7**, since an unexpected situation E has arisen at the estimated time point P_3, the identification information D_3 is not transmitted or received during the determination period W. Therefore, the stop determiner **48** determines that the quote progress has stopped ("NG" in FIG. **7**). In this case, counting of the time count value C (identification of an estimated time point P_4) by the time point identifier **44** and the display update by the playback controller **46** are deferred.

When the unexpected situation E ends, the distribution apparatus **10** resumes reproduction of the audio signal X (identification information D_n transmission). As shown in FIG. **7**, if the information receiver **50** receives the identification information D_3 for the first time after the quote progress has resumed, a time point at which the identification information D_3 is received is treated as a new estimated time point P_3, and the time point identifier **44** resumes counting the time count value C. After the estimated time point P_4 is reached, which is a time point when a time difference $Q_{3,4}$ has elapsed from the updated estimated time point P_3, the time point identifier **44** continues counting time after initializing the time count value C, and the playback controller **46** causes the display device **29** to display related information R_n of the quote L_n (related information R_4 and R_5) belonging to the quote group G_2. In other words, the

display of related information R_n of the quote L_n belonging to the quote group G_1 (related information R_1, R_2 and R_3) is updated to the display of related information R_n of the quote L_n (related information R_4 and R_5) belonging to the quote group G_2. This update is triggered by the arrival of the estimated time point P_4. The stop determiner **48** determines whether the quote progress has stopped depending on whether the information receiver **50** receives the identification information D_4 of the quote L_4 within a determination period W starting from the estimated time point P_4. When the stop determiner **48** determines that the quote progress has stopped, estimated time point P_n identification and related information R_n display update are deferred, as described above.

In the above description, the arrival of the estimated time point P_4 after the quote progress resumes triggers display of related information R_n of the quote L_n (related information R_4 and R_5) of the quote group G_2. Differently, in a state in which the display of related information R_n is updated for the first time after the quote progress resumes, both the arrival of the estimated time point P_4 and the reception of the identification information D_4 may serve as conditions for displaying the related information R_n for the quote group G_2.

FIG. **8** is an explanatory diagram illustrating a case where, as a result of an unexpected situation E arising between two consecutive quote group G_{m-1} and quote group G_m (i.e., immediately before the earliest quote L_n of the quote group G_m), the quote progress stops immediately before the earliest quote L_n of the quote group G_m. Specifically, FIG. **8** shows a case where an unexpected situation E arises between the quote L_3 of the quote group G_1 and the earliest quote L_4 of the immediately subsequent quote group G_2, and as a result the quote L_4 is delayed.

The stop determiner **48** determines whether the information receiver **50** receives the identification information D_4 of the quote L_4 within a determination period W starting from the estimated time point P_4 that the time point identifier **44** has identified. As shown in FIG. **8**, since an unexpected situation E has arisen at the estimated time point P_4, the identification information D_4 is not transmitted or received during the determination period W. Consequently, the stop determiner **48** determines that the quote progress has stopped ("NG" in FIG. **8**). In this case, counting of the time count value C (estimated time point P_5 identification) by the time point identifier **44** and the display update by the playback controller **46** are deferred.

When the unexpected situation E ends, the distribution apparatus **10** resumes reproducing the audio signal X (identification information D_n transmission). As shown in FIG. **8**, if the information receiver **50** receives the identification information D_4 for the first time after the quote progress has resumed, a time point at which the identification information D_4 is received is treated as a new estimated time point P_4, and the time point identifier **44** resumes counting the time count value C, starting from an initialized value. The playback controller **46** causes related information R_n of the quotes L_n (related information R_4 and R_5) belonging to the quote group G_2 to be displayed on the display device **29**. This display is triggered by receipt of the identification information D_4 by the information receiver **50**. Thus, the display of related information R_n of the quotes L_n (related information R_1, R_2 and R_3) of the quote group G_1 is updated to the display of related information R_n of the quotes L_n (related information R_4 and R_5) of the quote group G_2 when two conditions are satisfied, the two conditions being a) when the time difference $Q_{3,4}$ is counted by the time point identifier **44** (arrival of the estimated time point P_4 before update); and b) when the identification information D_4 of the quote L_4 is received.

As will be understood from the foregoing description, when the stop determiner **48** determines that the quote progress has stopped, the playback controller **46** defers update of related information R_n for display on the display device **29**, whereas the playback controller **46** resumes update of displayed related information R_n when the information receiver **50** receives the identification information D_n after determination by the stop determiner **48**. The above are examples of operations performed by the terminal apparatus **20** when an unexpected situation E arises.

FIG. **9** is a flowchart illustrating a process executed by the control device **21** of the terminal apparatus **20**. When the process of FIG. **9** starts, the time point identifier **44** waits until an estimated time point P_n is reached (SA**1**: NO). When the estimated time point P_n is reached (SA**1**: YES), the time point identifier **44** initializes the time count value C to zero and starts counting the time thereafter (SA**2**). The stop determiner **48** determines whether the quote progress has stopped depending on whether the information receiver **50** receives identification information D_n of a quote L_n during a determination period W including an estimated time point P_n (SA**3**). If the quote progress has not stopped (SA**4**: NO), the playback controller **46** determines whether an estimated time point P_n identified by the time point identifier **44** corresponds to the earliest quote L_n of the quote group G_m (SA**5**). When the estimated time point P_n of the earliest quote L_n of the quote group G_m (e.g., the estimated time point P_4 in FIG. **4**) (SA**5**: YES) is reached, the playback controller **46** causes the related information R_n of the quotes L_n belonging to the quote group G_m to be displayed on the display device **29** (SA**6**). On the other hand, if the estimated time point P_n corresponds to a quote L_n other than the earliest one of the quote group G_m (SA**5**: NO), the playback controller **46** maintains the current display of the related information R_n. Thus, as will be understood also from FIG. **4**, the display on the display device **29** is not updated even if a quote L_n other than the earliest one of the quote group G_m is played. After the above process is executed, the routine proceeds to a standby state and awaits arrival of the next estimated time point P_n (SA**1**).

As described in the foregoing, in the first embodiment, in a case where the quote progress has not stopped, related information R_n of a quote(s) L_n of the quote group G_m is displayed, the display being triggered by arrival of an estimated time point P_n corresponding to the earliest quote L_n of the quote group G_m. Thus, receipt of the identification information D_n is not a condition for updating the display of the related information R_n. Accordingly, even in an environment in which identification information D_n transmitted by the distribution apparatus **10** may not be properly received, it is possible to display related information R_n of quotes L_n in conjunction with the quote progress.

On the other hand, as illustrated in FIG. **7** and FIG. **8**, in a case where the quote progress has stopped (SA**4**: YES), the time point identifier **44** stops counting time of the time count value C (SA**7**). The routine then proceeds to a state of waiting for the information receiver **50** to receive the identification information D_n transmitted by the distribution apparatus **10** (SA**8**: NO). When the information receiver **50** receives identification information D_n (SA**8**: YES), the playback controller **46** determines whether the identification information D_n received by the information receiver **50** corresponds to the earliest quote L_n of the quote group G_m (SA**9**), by referring to the information table T, for example.

If the identification information D_n corresponds to a quote L_n other than the earliest one of the quote group G_m (SA**9**: NO), i.e., if an unexpected situation E arises immediately before the quote L_n other than the earliest one of the quote group G the display of related information R_n by the playback controller **46** is not updated (SA**10**). In this case, as described with reference to FIG. **7**, the time point identifier **44** treats a time point at which the identification information D_n is received as a new estimated time point P_n and resumes counting the time count value C (SA**11**).

If the identification information D_n corresponds to the earliest quote L_n of the quote group G_m (SA**9**: YES), i.e., if an unexpected situation E arises immediately before the earliest quote L_n of the quote group G_m, the playback controller **46**, as described above with reference to FIG. **8**, causes the related information R_n of multiple quotes L_n belonging to the quote group G_m to be displayed on the display device **29** (SA**10**). The time point identifier **44** then treats a time point at which the identification information D_n is received as a new estimated time point P_n, and resumes counting the time count value C (SA**11**).

As described in the foregoing, in the first embodiment, it is determined whether the quote progress has stopped depending on whether identification information D_n is received at around an estimated time point P_n at which each quote L_n is expected to take place. If it is determined that the quote progress has stopped, the playback controller **46** defers updating displayed related information R_n. In this way, after the quote progress has resumed, it is possible to play related information R_n of a quote L_n in conjunction with the quote progress. Furthermore, in the first embodiment, a time point at which a time difference specified by the information table T has elapsed from an estimated time point P_n of a quote L_n is identified as an estimated time point P_{n+1} of a quote L_{n+1}. Therefore, the first embodiment has an advantage in that an estimated time point P_n of each quote L_n can be identified with a simple configuration of counting up an elapsed time (time count value C) from each estimated time point P_n.

Second Embodiment

A second embodiment of the present invention is now described. In each of the configurations described below, elements having substantially the same actions or functions as those in the first embodiment will be denoted by the same reference symbols as those used in the description of the first embodiment, and detailed description thereof will be omitted as appropriate.

FIG. **10** is a block diagram of a terminal apparatus **20** according to the second embodiment. Similarly to that of the first embodiment, the distribution apparatus **10** sequentially transmits identification information D_n of quotes L_n via sound communication in conjunction with the quote progress in the show. As shown in FIG. **10**, a control device **21** of the terminal apparatus **20** in the second embodiment functions both as an information extractor **42** and a playback controller **46**. The information extractor **42**, similarly to that of the first embodiment, extracts identification information D_n from an audio signal Y generated by the sound receiving device **25**. Accordingly, the sound receiving device **25** and the information extractor **42** of the terminal apparatus **20** in the second embodiment, similarly to the first embodiment, function as an information receiver **50** that can receive identification information D_n of quotes L_n sequentially transmitted from the distribution apparatus **10**. In other words, identification information D_n of quotes L_n are sequentially extracted each time a quote L_n is voiced by the sound output device **18**.

Registered in the information table T stored in the storage device **23** of the second embodiment is a pair of identification information D_n (D_1, D_2, D_3, . . .) and related information R_n (R_1, R_2, R_3, . . .) for each of multiple quotes L_n that may be played in the show. The playback controller **46** retrieves related information R_n, from the information table T, which corresponds to the identification information D_n extracted by the information extractor **42**, to cause the retrieved related information R_n to be displayed on the display device **29**. In other words, in the second embodiment, related information R_n of quotes L_n are sequentially displayed on the display device **29**, triggered by receipt of the identification information D_n of a corresponding quote L_n.

FIG. **11** is a flowchart illustrating a process executed by the control device **21** of the terminal apparatus **20** according to the second embodiment. When the process of FIG. **11** starts, the playback controller **46** waits for the information receiver **50** to receive identification information D_n (SB**1**: NO). If the information receiver **50** receives identification information D_n (SB**1**: YES), the playback controller **46** retrieves from the information table T related information R_n that corresponds to the identification information D_n received by the information receiver **50**, to cause the retrieved related information R_n to be displayed on the display device **29** (SB**2**).

As a result of the above operation being executed, in the second embodiment, as shown in FIG. **12**, related information R_n of a quote L_n is displayed, triggered by receipt of corresponding identification information D_n of the quote L_n, where quotes L_n are transmitted chronologically. On the other hand, in a case where the quote progress has stopped due to occurrence of an unexpected situation E, for example, the identification information D_n transmission by the distribution apparatus **10** is deferred. Thus, as shown in FIG. **13**, after the quote progress resumes, in the second embodiment also it is possible to play related information R_n of the quote L_n in conjunction with the quote progress.

Modifications

Various modifications may be made to the embodiments described above. Specific modifications will be described below. Two or more modifications may be freely selected from the following and combined as appropriate so long as they do not contradict one another.

(1) In each of the above embodiments, related information R_n is displayed on the display device **29**. However, a method of playing the related information R_n is not limited thereto. For example, an audio signal representative of a sound of a spoken quote L_n may be stored for each quote L_n in the storage device **23** as related information R_n. A sound represented by thus stored related information R_n that corresponds to identification information D_n received by the information receiver **50** may be output as sound from a sound output device, such as speakers or headphones. It is of note that, in this case, the sound of a quote L_n may be voice synthesized using the quote L_n. As will be understood from the foregoing description, the playback controller **46** is understandable as an element for causing a playback device to play related information R_n. The playback device includes the display device **29** that displays related information R_n in the form of images and a sound output device that outputs a sound represented by related information R_n.

(2) In each of the above embodiments, as described with reference to FIG. **3**, the identification information D_n is

transmitted from the beginning of the playback section of a corresponding quote L_n. However, a relation between the playback section of a quote L_n and a time point at which the identification information D_n is transmitted is not limited thereto. For example, transmission of identification information D_n may start at a time point preceding the start of the playback section of a corresponding quote L_n. Using the above configuration, it is possible to determine whether the quote progress has stopped at a time point immediately before an estimated time point P_n.

Specifically, the stop determiner **48** determines whether the quote progress has stopped depending on whether the information receiver **50** receives identification information D_n of a quote L_n within a determination period W from a time point preceding an estimated time point P_n of each quote L_n up to a time point subsequent thereto. The determination period W is a period of a predetermined length having the estimated time point P_n as a midpoint, for example. By the above configuration, in a case where identification information D_n is transmitted before the start of the playback section of each quote L_n, it is possible to determine whether the quote progress has stopped before the arrival of an estimated time point P_n. On the other hand, in a configuration in which identification information D_n is transmitted from the start of the playback section of a corresponding quote L_n, the stop determiner **48** determines whether the information receiver **50** receives the identification information D_n within a determination period W starting from an estimated time point P_n as described in each of the above embodiments.

(3) In each of the above embodiments, text representative of each quote L_n is played (displayed) as related information R_n. However, the content of the related information R_n is not limited thereto. For example, a translated text or audio of the translated text of each quote L_n may be played as related information R_n, with the translated text being a rendering of an original text of each quote L_n in one language into another language. Alternatively, a commentary text of a show or audio thereof may be played as related information R_n.

In each of the above embodiments, an example is given of a case where there are played related information R_n of quotes L_n that are chronologically played. However, a scene in which the information providing system **100** is used is not limited to a show as described in each of the above embodiments. For example, the information providing system **100** according to each of the above embodiments may be used in a scene in which guidance voice spoken sequentially for guidance on various facilities such as transportation facilities (e.g. trains or buses), exhibition facilities (e.g., historic, science, or art museums), or tourist facilities. As will be understood from the above examples, the information providing system **100** is expressed in general terms as a computer system for providing related information R_n of each event transmitted in conjunction with a plurality of events (e.g., an event being outputting sound of quotes L_n or that of guidance) that take place chronologically. Likewise, playback of quotes L_n and guidance on various facilities are each understandable in general terms as events that occur chronologically, and the quote group G_m, which is described in each of the above embodiments, is an example of event groups into which multiple events are divided. A single event may include display of multiple pieces of information either simultaneously or sequentially (chronologically). An example thereof is display of multiple quotes L_n corresponding to quotes that are expressed in different languages (e.g., Japanese and a foreign language).

(4) In each of the above embodiments, it is determined whether the quote progress has stopped depending on whether the information receiver **50** receives identification information D_n at around an estimated time point P_n of each quote L_n. However, transmission of identification information D_n may be omitted for a quote(s) L_n other than the earliest one of the quote group G_m. For example, the distribution apparatus **10** may transmit a control signal not containing identification information D_n at a predetermined interval (e.g., at a freely-selected cycle that does not coincide a quote L_n), whereas the terminal apparatus **20** may sequentially identify estimated time points P_n at the same interval. By the above configuration, the stop determiner **48** determines whether the quote progress has stopped depending on whether the information receiver **50** receives a control signal at around an estimated time point P_n.

(5) Each of the above embodiments is configured to reproduce an audio signal X containing an audio component of a quote L_n and an audio component of identification information D_n. However, a configuration may be provided such that an audio signal X does not contain an audio component of each quote L_n. For example, an audio signal X may be generated by mixing, in real time and in conjunction with the progress of a show, an audio signal of a received voice of a performer of the show and an audio signal representative of an audio component of identification information D_n, and the thus generated audio signal X may be supplied to a sound output device. Further, in each of the above embodiments, a sound output device **18** that plays a quote L_n is used for transmitting identification information D_n. However, identification information D_n may be transmitted to a terminal apparatus **20** from a sound output device that is separate from a sound output device for playing quotes L_n.

(6) In each of the above embodiments, identification information D_n is transmitted to a terminal apparatus **20** via sound communication utilizing sound waves as a transmission medium, but a communication method for transmitting the identification information D_n to a terminal apparatus **20** is not limited to sound communication. For example, identification information D_n may be transmitted to a terminal apparatus **20** in synchronization with sound output of a quote L_n by the sound output device **18**, via wireless communication utilizing electromagnetic waves, such as radio waves or infrared rays, as a transmission medium. As will be understood from the above examples, short-range wireless communication that does not involve a communication network, such as a mobile communication network, is suitable for transmission of identification information D_n. Sound communication utilizing sound waves as a transmission medium and wireless communication utilizing electromagnetic waves are each examples of short-range wireless communication.

(7) In each of the above embodiments, the playback controller **46** causes related information R_n pre-stored in the storage device **23** of the terminal apparatus **20** to be selectively displayed on the display device **29**. However, related information R_n need not be acquired from the storage device **23**. For example, a configuration can be assumed in which a multiplicity of related information R_n are retained in a management server, and the terminal apparatus **20** communicates with the management server via a communication network. By the above configuration, the playback controller **46** transmits, to the management server, an information request specifying identification information D_n extracted by the information extractor **42**. The management server retrieves related information R_n corresponding to the iden-

tification information D_n specified by the information request, to transmit the retrieved related information R_n to the requesting terminal apparatus **20**. The playback controller **46** of the terminal apparatus **20** causes the related information R_n received from the management server to be displayed on the display device **29**.

(8) The terminal apparatus **20** illustrated in each of the above embodiments is realized by the control device **21** and a program working in coordination with each other. The program of the first embodiment is a program for causing a computer to function as: an information receiver **50** that can receive identification information D_n of each of multiple quotes L_n that are transmitted sequentially in conjunction with occurrence of the multiple quotes L_n; a time point identifier **44** that sequentially identifies estimated time points P_n at each of which each of the multiple quotes L_n is estimated to occur; a stop determiner **48** that determines whether the progress of the multiple quotes L_n has stopped depending on whether the information receiver **50** receives identification information D_n of each quote L_n at around an estimated time point P_n of each quote L_n; and a playback controller **46** that, for each of the multiple quote groups G_m obtained by temporally dividing the multiple quotes L_n, when an estimated time point P_n that corresponds to the earliest quote L_n of each quote group G_m is reached, causes related information R_n of a quote(s) L_n belonging to quote group G_m to be displayed on the display device **29**. When the stop determiner **48** determines that the progress of the multiple quotes L_n has stopped, the playback controller **46** defers update in the related information R_n it causes the display device **29** to display, and, when the information receiver **50** receives the identification information D_n after the determination, the playback controller **46** resumes update in the displayed related information R_n.

The program of the second embodiment is a program for causing a computer to function as: an information receiver **50** that can receive identification information D_n of each of multiple quotes L_n that are transmitted sequentially in conjunction with occurrence of the multiple quotes L_n; and a playback controller **46** that causes the display device **29** to display related information R_n of a quote L_n that corresponds to the identification information D_n received by the information receiver **50**.

Each of the programs of the first and second embodiments may be provided in a form stored in a computer-readable recording medium, and be installed on a computer. For instance, the storage medium may be a non-transitory storage medium, a preferable example of which is an optical storage medium, such as a CD-ROM (optical disc), and may also be a freely-selected form of well-known storage media, such as a semiconductor storage medium and a magnetic storage medium. The "non-transitory storage medium" is inclusive of any computer-readable recording media with the exception of a transitory, propagating signal, and does not exclude volatile recording media.

(9) Following are examples of configurations derived from the above embodiments.

First Mode

An information processing method according to an aspect (First Mode) of the present invention includes: receiving identification information for a plurality of events transmitted sequentially in conjunction with occurrences of the plurality of events; sequentially identifying estimated time points at each of which each event is estimated to occur; determining whether progress of the plurality of events has stopped depending on whether identification information for each event is received at around a corresponding estimated time point for each event; and in each of a plurality of event groups obtained by temporally dividing the plurality of events, when an estimated time point is reached for an earliest event among at least one event belonging to each event group, causing a playback device to play related information for the at least one event belonging to each event group, and when the progress of the plurality of events is determined to have stopped, deferring update in the related information, which the playback device is being caused to play, and then resuming the update in the related information when the identification information is received after the determination.

In the above mode, it is determined whether progress of the plurality of events has stopped depending on whether identification information for each event is received at around a corresponding estimated time point for each event, and when the progress of the plurality of events is determined to have stopped, update in the related information played at the playback device is deferred. Accordingly, even when the progress of a plurality of events has stopped, after progress resumes, related information for each event can be played in conjunction with the plurality of events. In contrast, when progress of a plurality of events has not stopped, related information for each event in an event group is played, being triggered by arrival of an estimated time point of the earliest event within the event group. In other words, it is not necessary to receive identification information for updating corresponding related information. Accordingly, even in an environment in which identification information cannot be properly received, it is possible to play related information for each event together with the progress of a plurality of events.

Second Mode

In a preferred example (Second Mode) of the First Mode, identifying of the estimated time points includes identifying a time difference between a first event and a second event from among the plurality of events, and identifying, as an estimated time point of the second event, a time point at which the time difference has elapsed from an estimated time point of the first event. In the above mode, a time point at which a time difference between a first event and a second event has elapsed from an estimated time point of the first event is identified as an estimated time point of the second event. Thus, this mode has an advantage in that an estimated time point of each event can be identified by way of a simple configuration of counting an elapsed time from each estimated time point. An information table specifying a time difference between two consecutive events is used for example, for identifying a time difference between the first event and the second event.

Third Mode

In a preferred example (Third Mode) of the First Mode or the Second Mode, the identifying of the estimated time points includes, upon receiving identification information for any one of the plurality of events after the progress of the plurality of events has stopped, treating a time point at which the identification was received as the estimated time point and identifying one or more estimated time points that follow, and when an event that corresponds to the identification information is the earliest event within one of the plurality of event groups, causing the playback device to play related information for at least one event of the one of the plurality of event groups. The playing of the related information is triggered by reception of the identification information. In the above mode, when receiving identification information after the progress of a plurality of events is determined to have stopped, a time point at which the

identification information was received is treated as an estimated time point, and subsequent estimated time points are identified. In this way, it is possible to resume update in related information when progress of a plurality of events resumes.

Fourth Mode

In a preferred example (Fourth Mode) of any one of the First Mode to the Third Mode, each of the plurality of events consists of playback of sound by a sound output device, and the receiving of the identification information includes receiving the identification information for each event via sound communication using the sound output device. In the above mode, a sound output device used for playing a sound (the playing of a sound corresponds to an event) is also used for communicating identification information for an event. Therefore, compared with a case of using a dedicated communication device for communicating identification information, identification information can be provided to a terminal apparatus by use of a simple configuration.

Fifth Mode

In a preferred example (Fifth Mode) of any one of the First Mode to the Fourth Mode, the determination includes determining whether the identification information for each event is received during a determination period starting from each estimated time point of each event. This mode is suitable for a case in which identification information is transmitted at the same time as that at which a corresponding event takes place.

Sixth Mode

In a preferred mode (Sixth Mode) of any one of the First Mode to the Fourth Mode, the determination includes determining whether the identification information for each event is received during a determination period from a time point preceding each estimated time point of each event up to a time point subsequent to each estimated time point. This mode is suitable for a case where identification information is transmitted before an event takes place.

Seventh Mode

A terminal apparatus according to another aspect (Seventh Mode) of the present invention has: an information receiver configured to receive identification information for each of a plurality of events that are transmitted sequentially in conjunction with occurrences of the plurality of events; a time point identifier configured to sequentially identify estimated time points at each of which each event is estimated to occur; a stop determiner configured to determine whether progress of the plurality of events has stopped depending on whether the information receiver receives identification information for each event at around a corresponding estimated time point for each event; a playback controller configured to cause, for each of a plurality of event groups obtained by temporally dividing the plurality of events, when an estimated time point is reached for an earliest event among at least one event belonging to each event group, a playback device to play related information for the at least one event belonging to each event group, and when the stop determiner determines that the progress of the plurality of events has stopped, defer update in the related information, which the playback device is being caused to play, and then resume the update in the played related information when the identification information is received by the information receiver after the determination.

In the above mode, it is determined whether progress of the plurality of events has stopped depending on whether identification information for each event is received at around a corresponding estimated time point for each event, and when the progress of the plurality of events is determined to have stopped, update in the related information played at the playback device is deferred. Accordingly, even when the progress of a plurality of events has stopped, after progress resume, related information for each event can be played in conjunction with the plurality of events. In contrast, when the progress of a plurality of events has not stopped, related information for each event in an event group is played, being triggered by arrival of an estimated time point of the earliest event within the event group. In other words, it is not necessary to receive identification information for updating corresponding related information. Accordingly, even in an environment in which identification information cannot be properly received, it is possible to play related information for each event in conjunction with the progress of a plurality of events.

Eighth Mode

A terminal apparatus according to still another aspect (Eighth Mode) of the present invention has: an information receiver configured to receive identification information for a plurality of events transmitted sequentially in conjunction with occurrences of the plurality of events; and a playback controller configured to cause a playback device to play related information for each event that corresponds to the identification information of each event received by the information receiver. In the above mode, related information is played, triggered by receipt of identification information for each event, where identification information is sequentially transmitted in conjunction with occurrences of a plurality of events. Therefore, even if the progress of a plurality of events stops, after progress resumes, related information for each event can be played in conjunction with the plurality of events.

DESCRIPTION OF REFERENCE SIGNS

100 . . . information providing system, **10** . . . distribution apparatus, **12**,**21** . . . control device, **14**,**23** . . . storage device, **16**,**27** . . . input device, **18** . . . sound output device, **20** . . . terminal apparatus, **25** . . . sound receiving device, **29** . . . display device, **42** . . . information extractor, **44** . . . time point identifier, **46** . . . playback controller, **48** . . . stop determiner, **50** . . . information receiver.

What is claimed is:

1. An information processing method comprising:

storing, in a table in a memory, identification information and related information corresponding to each of a plurality of events, and a plurality of time differences corresponding to each pair of consecutive events in the plurality of events, the plurality of events being temporally divided into a plurality of event groups each including at least one event;

receiving the identification information for each of the plurality of events, the identification information being transmitted sequentially in conjunction with occurrence of the plurality of events;

sequentially identifying time points each at which a respective event among the plurality of events is estimated to occur by identifying:

from the stored table, a time difference between a first event and a second event from among the plurality of events; and

the time point of the second event, at which the time difference has elapsed from the time point of the first event;

determining, for each event, that progress of the plurality of events has stopped in a case where identification information corresponding to the respective event is not

received during a determination period associated with the corresponding identified time point of the respective event;

updating, of the plurality of event groups, the related information when the identified time point is reached for an earliest event among the at least one event belonging to the respective event group, by causing a playback device to play the related information associated with the at least one event belonging to the respective event group; and

deferring the updating of the played related information, in a case where the progress of the plurality of events is determined to have stopped, and then resuming the updating of the played related information, when the identification information is received after the determining.

2. The information processing method according to claim **1**, wherein:

the identifying of the time points, upon receiving identification information for any one of the plurality of events after the progress of the plurality of events has stopped, identifies the time point at which the identification was received, identifies at least one time point that follows, and

the updating, when the event corresponding to the identification information is the earliest event within one of the plurality of event groups, causes the playback device to play related information for at least one event among the one of the plurality of event groups, the playing of the related information being triggered by reception of the identification information.

3. The information processing method according to claim **1**, wherein:

each of the plurality of events consists of playback of sound by a sound output device, and

the receiving of the identification information receives the identification information for each event via sound communication using the sound output device.

4. The information processing method according to claim **1**, wherein the determining determines whether the identification information for each event is received during the determination period starting from each identified time point of each event.

5. The information processing method according to claim **1**, wherein the determining determines whether the identification information for each event is received during the determination period from a time point preceding each identified time point of each event up to a time point subsequent to each identified time point.

6. A terminal apparatus comprising:

at least one memory storing instructions; and

at least one processor that implements the instructions to:

store, in a table in the at least one memory, identification information and related information corresponding to each of a plurality of events, and a plurality of time differences corresponding to each pair of consecutive events in the plurality of events, the plurality of events being temporally divided into a plurality of event groups each including at least one event;

receive the identification information of the plurality of events, the identification information being transmitted sequentially in conjunction with occurrence of the plurality of events;

sequentially identify time points each at which a respective event among the plurality of events is estimated to occur by identifying:

from the stored table, a time difference between a first event and a second event from among the plurality of events; and

the time point of the second event, at which the time difference has elapsed from the time point of the first event;

determine, for each event, that progress of the plurality of events has stopped in a case where identification information corresponding to the respective event is not received during a predetermined period associated with the corresponding identified time point of the respective event;

update, of the plurality of event groups, the related information when the identified time point is reached for an earliest event the among at least one event belonging to the respective event group, by causing a playback device to play the related information associated with the at least one event belonging to the respective event group; and

defer the update of the played related information, in a case where the progress of the plurality of events is determined to have stopped, and then resume the update of the played related information when the identification information is received after the determining.

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